The City College
of New York

Quantifying the Spatial Coherence of Deficit and Excess Rainfall across the Continental United States

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Historical Observations: Simultaneous Extreme Events

Year 1998

Year 2007

Are spatiotemporal frequency of simultaneous hydrologic deficits and excesses related to the variability in large-scale climate and atmospheric features?

Results: Climate Impact Assessment
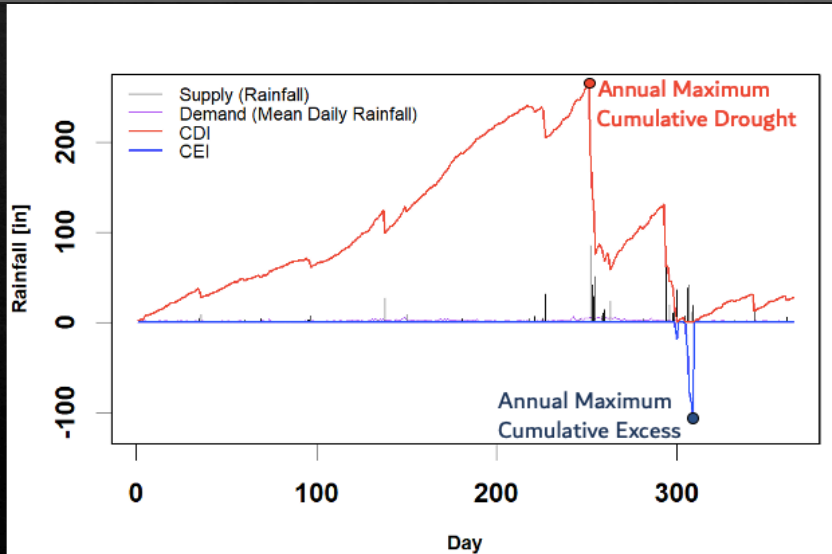
Robust Principle Component Analysis (rPCA)

Minimize $\|L\|_* + \lambda\|S\|_1$ subject to $M = L + S$

Year = 2007

- Drought
- Excess Rainfall

ENSO Coefficient (Drought)

ENSO Coefficient (Excess Rainfall)

Climate Model
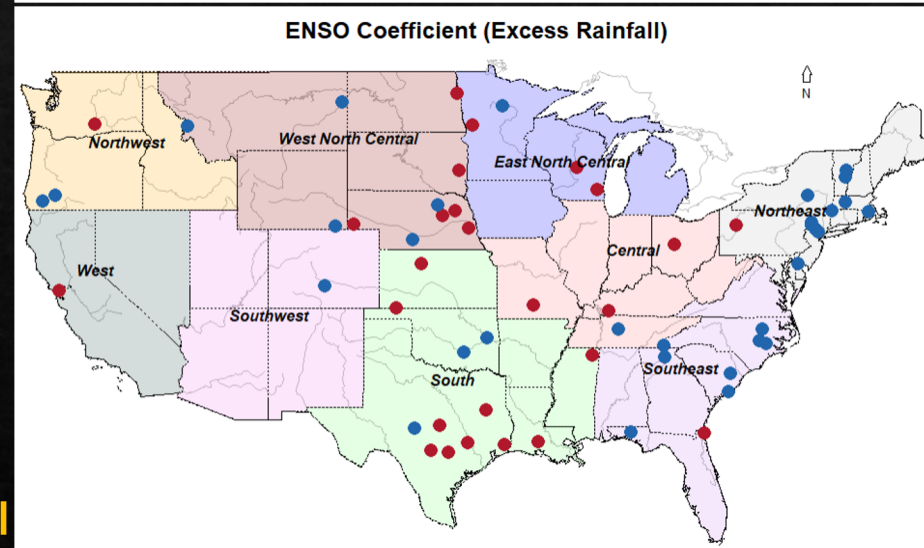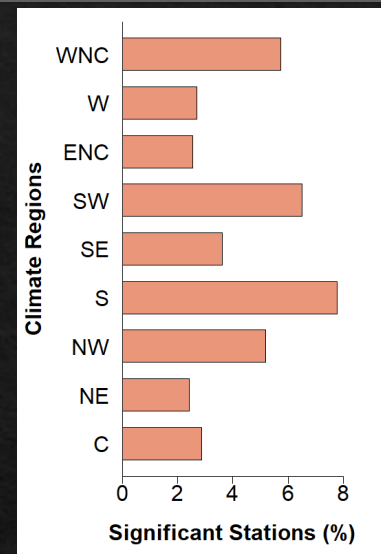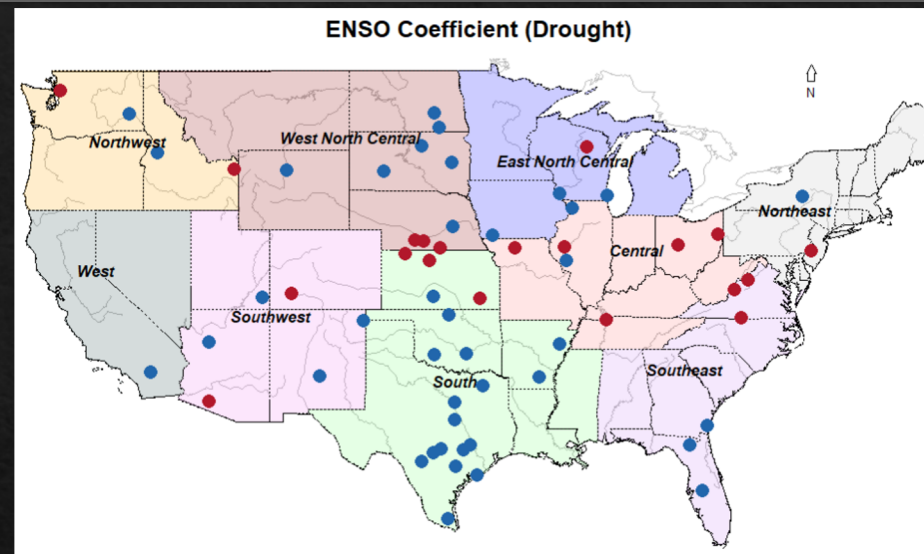
$S[i, t] \sim Bin(Pr[i, t])$

$logit(Pr[i, t]) = \alpha[i] + \beta[i]*ENSO[t]$ (i: Stations, t: Years)

Summary

- We quantify and detect simultaneous extremes in floods and droughts using robust PCA technique (ML algorithm)

- Separation of joint outliers better facilitates their modeling with large-scale teleconnection indices

- Significant number of stations in the Northeast USA are associated with ENSO for the prediction of *annual excess rainfall*
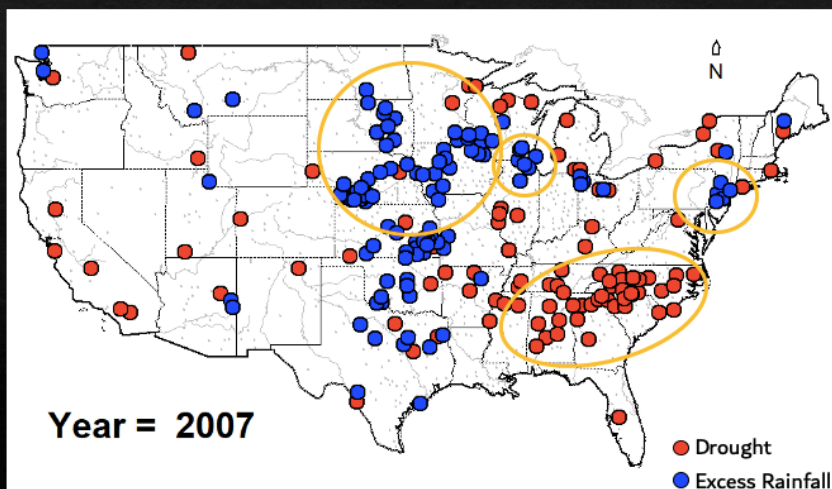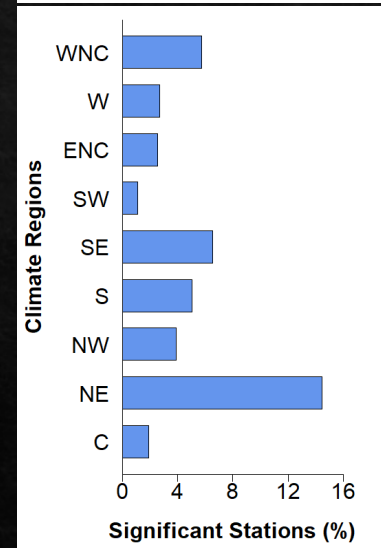
- Significant number of stations in the Southern USA are associated with ENSO for the prediction of *annual deficits in rainfall*

- The timing of these extremes can be related to regional-scale atmospheric controls

- A complete prediction model is now being explored which includes multi-scale climate variables